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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/559,864

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Natacha Haik-Beraud

Serie 6095

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AIR LIQUIDE

Intellectual Property

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EXAMINER

NGUYEN, NGOC YEN M

ART UNIT

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1793

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/559,864	<b>Applicant(s)</b> HAIK-BERAUD ET AL.	
	<b>Examiner</b> Ngoc-Yen M. Nguyen	<b>Art Unit</b> 1793	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 22 June 2009.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 13-24 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 13-24 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                     | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

### DETAILED ACTION

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 13-24 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Applicants are requested to point out support in the instant specification, by page and line numbers, for contacting the gas stream with a first catalyst bed first to produce a partially purified gas stream before contacting the partially purified gas stream with an adsorption bed to adsorb at least one metal carbonyl.

In Applicants' specification, it is disclosed that in practice, the order of removal of the pollutants present in a gas is an important order (note page 4, lines 1-2). As shown in Figure 1, the gas stream is passed through the 1st adsorption reactor (2) (note page 11, lines 7-26), which contains a first adsorption bed, then through a 2nd treatment reactor (8) "successively" comprising, in the gas stream flow direction, the second adsorption bed 9, the second catalyst 10, the third adsorption bed 11 and the first catalyst bed 12 serving to convert at least part of the oxygen and the unsaturated hydrocarbons present in the gas. The bed 9 is placed upstream of the catalyst bed 12 and/or the beds 10 and 11 in order to product it or them (note page 12, lines 4-13). The

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second absorption bed is used to adsorb the metal carbonyls (note page 12, lines 28-29). Thus, the catalyst bed 12 is the same as the first catalyst bed in step (a) of claim 1, and the adsorption bed 9 is the same as the adsorption bed in step (b); however, as clearly shown in Figure 1, the adsorption bed 9 is upstream of the catalyst bed 12, not downstream as now required in the instant claim 1. Also, the gas can be purified by the TSA process using the "succession" of adsorption and catalyst beds given in Tables 1-5, and in these Tables, the step of removing metal carbonyls (second adsorption step) is always carried before the step of removing oxygen and unsaturated hydrocarbons (first catalyst bed).

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 17 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 17, it is unclear if the "first adsorption bed to adsorb at least part of the HCN ...germanium" is the same as the "first adsorption bed to adsorb at least one metal carbonyl" as required in the independent claim 13.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 13-15, 18-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Eijkhoudt et al (6,165,428) in view of Krueger (4,034,062) and Bancon et al (2003/0126089), optionally further in view of Engelbrecht et al (4,320,100).

Eijkhoudt '428 discloses a process for the removal of metal carbonyl from a gaseous stream such as synthesis gas using an adsorbent (note column 1, lines 4-6). Eijkhoudt '428 teaches that the presence of metal carbonyls in synthesis gas which is used as feedstock for industrial processes catalyzed by catalysts, poses severe problems. The catalysts can be poisoned by the metal carbonyls or their decomposition products and as a consequent perform less (note column 1, lines 6-10).

The synthesis gas contains 50% by volume of Co and 40% of hydrogen (note Table 1).

After the step of removing metal carbonyl, the gas is subjected to a hydrogen sulfide and/or CO<sub>2</sub> removing step (note claim 10), such as a process using cold methanol in a physical washing system to remove CO<sub>2</sub> (note paragraph bridging columns 1-2).

The difference is Eijkhoudt '428 does not disclose the step of contacting the gas stream with a catalyst bed to convert at least part of the oxygen and/or at least one unsaturated hydrocarbon present in the gas stream to one or more catalysis products.

Bancon '989 is applied to teach that synthesis gas may contain other impurities such as light hydrocarbons impurities (such as ethane, ethylene, propylene, etc.), CO<sub>2</sub> and/or NO<sub>x</sub> (note paragraphs [0020] and [0030]).

Krueger '062 discloses a process for the purification of a gas stream containing primarily hydrogen and carbon monoxide as well as small quantities of oxygen, acetylene and ethylene as impurities, comprising passing said gas stream at a temperature of 250 to 700°F (121-371°C) through a bed of catalyst consisting essentially of a copper catalyst (note claim 1).

Krueger '062 further teaches that hydrogenation processes for removing oxygen, acetylene and ethylene are well known and no departures from well-known hydrogenation processes are required herein. The pressure is in the range of 100 to 500 psig (6.9 to 34.5 bar) (note column 1, lines 65-67). The space velocity is in the range of 2,000 to 10,000 gas volumes per volume of catalyst per hour, depending on the type of catalyst used (note column 1, line 67 to column 2, line 2). These ranges overlap the claimed ranges. With respect to the encompassing and overlapping ranges previously discussed, the subject matter as a whole would have been obvious to one of ordinary skill in the art at the time of invention to select the portion of the prior art's range which is within the range of the applicants' claims because it has been held *prima facie* case of obviousness to select a value in a known range by optimization for the results. *In re Boesch*, 205 USPQ 215. Additionally, the subject matter as a whole would have been obvious to one of ordinary skill in the art at the time invention was made to have selected the overlapping portion of the range disclosed by the reference because

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overlapping ranges have been held to be a prima facie case of obviousness. *In re Malagari*, 182 USPQ 549.

The step of contacting the synthesis gas with the copper catalyst as disclosed in Krueger '989 would inherently remove any NO<sub>x</sub> compounds that may be present in the synthesis gas as disclosed in Bancon '989.

Optionally, Engelbrecht '100 can be applied to teach that it is conventional in the art to remove nitrogen oxide and oxygen from a synthesis gas by passing the gas over a hydrogenation catalyst at a temperature of from 120 to 250°C and at a pressure of from 0.5 to 250 bar (note claim 1).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to remove any light hydrocarbon contained in the synthesis gas of Eijkhoudt '428, as suggested by Bancon '989, by contacting the synthesis gas with a copper catalyst as suggested by Krueger '989 to remove all or substantially hydrocarbon impurities such as ethylene.

Bancon '989 can be further applied to teach that If the amount of CO<sub>2</sub> contained in the stream of syngas to be purified is greater than several thousands of ppm, it is firstly washed with amines (MEA or MDEA type) to remove most of the CO<sub>2</sub>. The gas is then sent to a column of adsorbent(s) to remove the residual traces of CO<sub>2</sub> (a few tens of ppm) not removed by the washing with amines and possibly the other impurity or impurities present in the syngas, for example water that is often present at the same time as CO<sub>2</sub> (after washing with the amines, the gas is saturated with water) (note paragraph [0007]).

Claims 16-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Eijkhoudt '428 in view of Bancon '989 and Krueger '062, optionally further in view of Engelbrecht '100 as applied to claims 13-15, 18-24 above, and further in view of Koveal et al (5,948,378) and Britton et al (4,175,928).

The difference not yet discussed is Eijkhoudt '428 does not disclose the step of removing organosulfur, organochlorine, organonitrogen compounds or the step of removing HCN or a metal from the synthesis gas.

Britton '928 discloses that it is known in the art to remove sulfur compounds, organic sulfur compounds from synthesis gas by first converting them to hydrogen sulfide in a catalytic hydrogenation reactor and the hydrogen sulfide is then adsorbed from the synthesis gas stream by passing it through a suitable sorbent (note column 1, lines 64-68).

Koveal '378 discloses a process for removing ammonia and hydrogen cyanide from a synthesis that includes a step of passing the synthesis gas through a bed of absorbent or adsorbent effective for removal of ammonia and hydrogen cyanide, such as activated carbon or alumina (note column 2, lines 21-24).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to further purify the synthesis gas of Eijkhoudt '428 to remove other common impurities such as organic sulfur compounds, hydrogen cyanide by using known and conventional methods as suggested by Britton '928 and Koveal '378.



Applicant's arguments filed June 22, 2009 have been fully considered but they are not persuasive.

In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

Applicants argue that claim 13 of the instant application requires that the subject gas stream have at least four basic components: hydrogen, carbon monoxide, at least one metal carbonyl and either oxygen or an unsaturated hydrocarbon.

In Eijkhoudt '428, the synthesis gas would include the hydrogen, carbon monoxide (note Table 1 as required in Applicants' claims. Eijkhoudt '428 also teaches the presence of a metal carbonyl. Bancon '989 is applied as stated above to teach that synthesis gas may contain other impurities such as light hydrocarbon impurities, CO<sub>2</sub> and/or NO<sub>x</sub>.

Applicants argue that the first purification bed (it is assumed that Applicants refer to the first catalyst bed in step a) of claim 1) must accept a gas stream with metal carbonyls, operate safely with such a contaminant, and remove effectively none of the these metal carbonyls, as this is the specified function of the second bed.

As stated in the above 112, 1st paragraph rejection above, Applicants' specification does not have sufficient support for the process as required in claim 13, i.e. removing the hydrocarbon and/or oxygen before removing the metal carbonyl. However, as disclosed in Eijkhoudt '428, the step of removing the metal carbonyls is carried out first in order to avoid the catalyst poisoning that is caused by the presence of the metal carbonyls, however, it would have been obvious to one skilled in the art to remove the metal carbonyls after any step that requires the use of a catalyst if the problem of catalyst poisoning is not a concern. Applicants have not provided any evidence to show that the presence of metal carbonyls would completely prevent the removal of oxygen and/or hydrocarbon using a catalyst.

Applicants argue that Kueger '062, Bancon '989 and Engelbrecht '100 do not disclose a catalyst bed that comes into contact with a gas stream containing metal carbonyls.

The above references are not relied upon to disclose a gas stream containing metal carbonyls. As disclosed in Eijkhoudt '428, the presence of metal carbonyls causes catalyst poisoning and the catalysts perform less. This fairly suggests that the catalysts still perform but may need to be regenerated or replaced more often. Applicants have not provided any evidence to show that the claimed process does not suffer from the same problem when removing oxygen and/or hydrocarbon using a catalyst from a gas stream containing metal carbonyls.

The rejection of claims 16-17 is maintained for the same reasons as stated above.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ngoc-Yen M. Nguyen whose telephone number is (571) 272-1356. The examiner can normally be reached on Part time schedule.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stanley Silverman can be reached on (571) 272-1358. The fax phone

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number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Ngoc-Yen M. Nguyen/  
Primary Examiner, Art Unit 1793

nmn  
November 10, 2009